

Abstract of Final Report

Urbanization on the small subtropical island of Oahu, Hawaii provides an opportunity to examine how anthropogenic activity affects the composition of material transferred from land to ocean by streams. This paper investigates the variability in concentrations of trace elements (Pb, Zn, Cu, Ba, Co, As, Ni, V, and Cr) in streams of watersheds on Oahu, Hawaii. We focus on water and suspended particulate matter collected from the Ala Wai Canal watershed in Honolulu and also examine the Kaneohe Stream watershed. As predicted, suspended particulate matter controls most trace element transport. Elements such as Pb, Zn, Cu, Ba, and Co exhibit increased concentrations within urbanized portions of the watersheds. Particulate concentrations of these elements vary temporally during storms owing to input of road runoff containing elevated concentrations of elements associated with vehicular traffic and other anthropogenic activities. We interpret enrichments of As in samples from predominantly conservation areas to reflect agricultural use of fertilizers at the boundaries of urban and conservation lands. Particulate Ni, V, and Cr exhibit distributions during storm events that suggest a mineralogical control. Principal component analysis of particulate trace element concentrations establishes eigenvalues that account for nearly 80% of the total variance and separates trace elements into 3 factors. Factor 1 includes Pb, Zn, Cu, Ba, and Co, interpreted to represent metals with an urban anthropogenic enrichment. Factor 2 includes Ni, V, and Cr, elements whose concentrations do not appear to derive from anthropogenic activity, and is interpreted to reflect mineralogical control. Another, albeit less significant, anthropogenic factor includes As, Cd and U, and is thought to represent agricultural inputs. Samples collected during a storm derived from an offshore low-pressure system suggest that downstream transport of upper watershed material during tradewind-derived rains results in a 2-3-fold dilution of the particulate concentrations of Pb, Zn, and Cu in the Ala Wai canal watershed.